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SKU: 9781259969430-SOLUTIONS

EXERCISE SET 2-1

1. Frequency distributions are used to organize data in a meaningful way, to determine the shape of the distribution, to facilitate computational procedures for statistics, to make it easier to draw charts and graphs, and to make comparisons among different sets of data.

2. Categorical distributions are used with nominal or ordinal data, ungrouped distributions are used with data having a small range, and grouped distributions are used when the range of the data is large.

3. Five to twenty classes. Width should be an odd number so that the midpoint will have the same place value as the data.

4. An open-ended frequency distribution has either a first class with no lower limit or a last class with no upper limit. They are necessary to accomodate all the data.

5.
Boundaries: 57.5 – 62.5
Midpoint: 60
Width: 5

6.
Boundaries: 124.5 – 131.5
Midpoint: 128
Width: 7

7.
Boundaries: 16.345 – 18.465
Midpoint: 17.405
Width: 2.12

8.
Boundaries: 16.25 – 18.55
Midpoint: 17.4

8. continued
Width: 2.3

9. Class width is not uniform.

10. Class limits overlap, and class width is not uniform.

11. A class has been omitted.

12. Class width is not uniform.

13.

Class	*f*	*Percent*
V	6	12
C	7	14
M	22	44
H	3	6
P	12	24
	50	100

The mocha flavor class has the most data values and the hazelnut class has the least number of data values.

14.

Class	*f*	*Percent*
A	4	10%
M	28	70%
H	6	15%
S	2	5%
	40	100%

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15.

Limits	*Boundaries*	*f*
0	–0.5 - 0.5	2
1	0.5 - 1.5	5
2	1.5 - 2.5	24
3	2.5 - 3.5	8
4	3.5 - 4.5	6
5	4.5 - 5.5	4
6	5.5 - 6.5	0
7	6.5 - 7.5	1
		50

	cf
Less than –0.5	0
Less than 0.5	2
Less than 1.5	7
Less than 2.5	31
Less than 3.5	39
Less than 4.5	45
Less than 5.5	49
Less than 6.5	49
Less than 7.5	50

The category "twice a week" has more values than any other category.

16.

Limits	*Boundaries*	*f*
3	2.5 - 3.5	2
4	3.5 - 4.5	4
5	4.5 - 5.5	4
6	5.5 - 6.5	1
7	6.5 - 7.5	4
8	7.5 - 8.5	3
9	8.5 - 9.5	2
		20

16. continued

	cf
Less than 2.5	0
Less than 3.5	2
Less than 4.5	6
Less than 5.5	10
Less than 6.5	11
Less than 7.5	15
Less than 8.5	18
Less than 9.5	20

17.

H = 93 L = 48

Range = 93 − 48 = 45

Width = 45 ÷ 7 = 6.4 round up to 7

Limits	*Boundaries*	*f*
48 - 54	47.5 - 54.5	3
55 - 61	54.5 - 61.5	2
62 - 68	61.5 - 68.5	9
69 - 75	68.5 - 75.5	13
76 - 82	75.5 - 82.5	8
83 - 89	82.5 - 89.5	3
90 - 96	89.5 - 96.5	2
		40

	cf
Less than 47.5	0
Less than 54.5	3
Less than 61.5	5
Less than 68.5	14
Less than 75.5	27
Less than 82.5	35
Less than 89.5	38
Less than 96.5	40

18.

H = 110 L = 54

Range = 110 − 54 = 56

Width = 56 ÷ 7 = 8 round up to 9

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18. continued

Limits	*Boundaries*	*f*
54 - 62	53.5 - 62.5	7
63 - 71	62.5 - 71.5	6
72 - 80	71.5 - 80.5	8
81 - 89	80.5 - 89.5	4
90 - 98	89.5 - 98.5	1
99 - 107	98.5 - 107.5	3
108 - 116	107.5 - 116.5	1
		30

	cf
Less than 53.5	0
Less than 62.5	7
Less than 71.5	13
Less than 80.5	21
Less than 89.5	25
Less than 98.5	26
Less than 107.5	29
Less than 116.5	30

19.

H = 70 L = 27

Range = 70 − 27 = 43

Width = 43 ÷ 7 = 6.1 or 7

Limits	*Boundaries*	*f*
27 - 33	26.5 - 33.5	7
34 - 40	33.5 - 40.5	14
41 - 47	40.5 - 47.5	15
48 - 54	47.5 - 54.5	11
55 - 61	54.5 - 61.5	3
62 - 68	61.5 - 68.5	3
69 - 75	68.5 - 75.5	2
		55

19. continued

	cf
Less than 26.5	0
Less than 33.5	7
Less than 40.5	21
Less than 47.5	36
Less than 54.5	47
Less than 61.5	50
Less than 68.5	53
Less than 75.5	55

20.

H = 177,500 L = 70,000

Range = 177,500 − 70,000 = 107,500

Width = 107,500 ÷ 6 = 17,916.67

round up to 17,917

Limits	*Boundaries*	*f*
70,000 - 87,916	69,999.5 - 87,916.5	1
87,917 - 105,833	87,916.5 - 105,833.5	3
105,834 - 123,750	105,833.5 - 123,750.5	7
123,751 - 141,667	123,750.5 - 141,667.5	6
141,668 - 159,584	141,667.5 - 159,584.5	5
159,585 - 177,502	159,584.5 - 177,502.5	3
		25

	cf
Less than 69,999.5	0
Less than 87,916.5	1
Less than 105,833.5	4
Less than 123,750.5	11
Less than 141,667.5	17
Less than 159,584.5	22
Less than 177,502.5	25

21.

H = 88 L = 12

Range = 88 − 12 = 76

Width = 76 ÷ 9 = 8.4 round up to 9

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21. continued

Limits	*Boundaries*	*f*
12 - 20	11.5 - 20.5	7
21 - 29	20.5 - 29.5	7
30 - 38	29.5 - 38.5	3
39 - 47	38.5 - 47.5	3
48 - 56	47.5 - 56.5	4
57 - 65	56.5 - 65.5	3
66 - 74	65.5 - 74.5	0
75 - 83	74.5 - 83.5	2
84 - 92	83.5 - 92.5	1
		30

	cf
Less than 11.5	0
Less than 20.5	7
Less than 29.5	14
Less than 38.5	17
Less than 47.5	20
Less than 56.5	24
Less than 65.5	27
Less than 74.5	27
Less than 83.5	29
Less than 92.5	30

22.

H = 51.7 L = 1.2

Range = 51.7 − 1.2 = 50.5

Width = 50.5 ÷ 5 = 10.1 round up to 11

Limits	*Boundaries*	*f*
0 - 10	-0.5 - 10.5	7
11 - 21	10.5 - 21.5	6
22 - 32	21.5 - 32.5	2
33 - 43	32.5 - 43.5	0
44 - 54	43.5 - 54.5	1
		16

22. continued

	cf
Less than -0.5	0
Less than 10.5	7
Less than 21.5	13
Less than 32.5	15
Less than 43.5	15
Less than 54.5	16

23.

H = 49 L = 14

Range = 49 − 14 = 35

Width = 7

Limits	*Boundaries*	*f*
14 - 20	13.5 - 20.5	10
21 - 27	20.5- 27.5	11
28 - 34	27.5- 34.5	6
35 - 41	34.5- 41.5	8
42 - 48	41.5 - 48.5	4
49 - 55	48.5 - 55.5	1
		40

	cf
Less than 13.5	0
Less than 20.5	10
Less than 27.5	21
Less than 34.5	27
Less than 41.5	35
Less than 48.5	39
Less than 55.5	40

24.

H = 3462 L = 3

Range = 3462 − 3 = 3459

Width = 3459 ÷ 9 = 384.3

round up to 385

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24. continued

Limits	*Boundaries*	*f*
3 - 387	2.5 - 387.5	33
388 - 772	387.5 - 772.5	11
773 - 1157	772.5 - 1157.5	3
1158 - 1542	1157.5 - 1542.5	2
1543 - 1923	1542.5 - 1923.5	0
1924 - 2312	1923.5 - 2312.5	0
2313 - 2697	2312.5 - 2697.5	1
2698 - 3082	2697.5 - 3082.5	0
3083 - 3467	3082.5 - 3467.5	1
		51

	cf
Less than 2.5	0
Less than 387.5	33
Less than 772.5	44
Less than 1157.5	47
Less than 1542.5	49
Less than 1923.5	49
Less than 2312.5	49
Less than 2697.5	50
Less than 3082.5	50
Less than 3467.5	51

25.

H = 12.3 L = 6.2

Range = 12.3 − 6.2 = 6.1

Width = 6.1 ÷ 7 = 0.87 round up to 0.9

Limits	*Boundaries*	*f*
6.2 - 7.0	6.15 - 7.05	1
7.1 - 7.9	7.05 - 7.95	7
8.0 - 8.8	7.95 - 8.85	9
8.9 - 9.7	8.85 - 9.75	7
9.8 - 10.6	9.75 - 10.65	8
10.7 - 11.5	10.65 - 11.55	4
11.6 - 12.4	11.55 - 12.45	4
		40

25. continued

	cf
Less than 6.15	0
Less than 7.05	1
Less than 7.95	8
Less than 8.85	17
Less than 9.75	24
Less than 10.65	32
Less than 11.55	36
Less than 12.45	40

26.

H = 37.9 L = 17.3

Range = 37.9 − 17.3 = 20.6

Width = 20.6 ÷ 6 = 3.43 round up to 3.5

Limits	*Boundaries*	*f*
17.3 - 20.2	17.25 - 20.25	4
20.3 - 23.2	20.25 - 23.25	6
23.3 - 26.2	23.25 - 26.25	18
26.3 - 29.2	26.25 - 29.25	8
29.3 - 32.2	29.25 - 32.25	6
32.3 - 35.2	32.25 - 35.25	7
35.3 - 38.2	35.25 - 38.25	1
		50

	cf
Less than 17.25	0
Less than 20.25	4
Less than 23.25	10
Less than 26.25	28
Less than 29.25	36
Less than 32.25	42
Less than 35.25	49
Less than 38.25	50

27. The percents add up to 101%. They should total 100% unless rounding was used.

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28.

Class	*f*
0	1
1	4
2	5
3	7
4	4
5	4
6	3
7	3
8	5
9	5

No. Zero appears only once and 3 appears 7 times.

EXERCISE SET 2-2

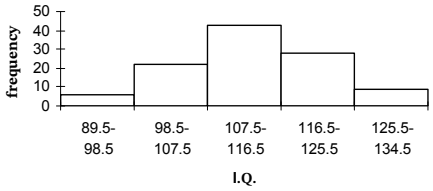
1.

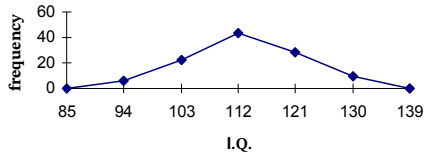
Limits	*Boundaries*	X_m	*f*
90 - 98	89.5 - 98.5	94	6
99 - 107	98.5 - 107.5	103	22
108 - 116	107.5 - 116.5	112	43
117 - 125	116.5 - 125.5	121	28
126 - 134	125.5 - 134.5	130	9
			108

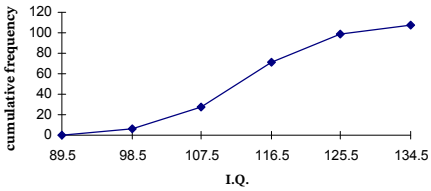
	cf
Less than 89.5	0
Less than 98.5	6
Less than 107.5	28
Less than 116.5	71
Less than 125.5	99
Less than 134.5	108

Eighty applicants do not need to enroll in the developmental programs.

1. continued







2.

Limits	*Boundaries*	X_m	*f*
1 - 25	0.5 - 25.5	13	16
26 - 50	25.5 - 50.5	38	14
51 - 75	50.5 - 75.5	63	9
76 - 100	75.5 - 100.5	88	8
101 - 125	100.5 - 125.5	113	5
126 - 150	125.5 - 150.5	138	0
151 - 175	150.5 - 175.5	163	1
176 - 200	175.5 - 200.5	188	1
201 - 225	200.5 - 225.5	213	0
226 - 250	225.5 - 250.5	238	0
251 - 275	250.5 - 275.5	263	2
			56

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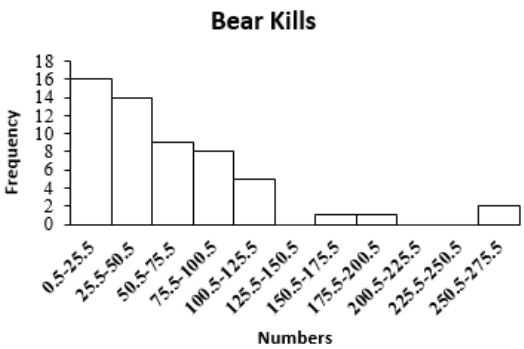
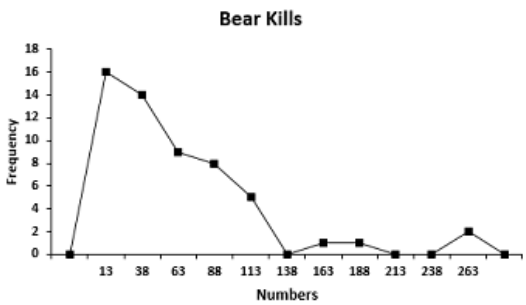
2. continued

	cf
Less than 0.5	0
Less than 25.5	16
Less than 50.5	30
Less than 75.5	39
Less than 100.5	47
Less than 125.5	52
Less than 150.5	52
Less than 175.5	53
Less than 200.5	54
Less than 225.5	54
Less than 250.5	54
Less than 275.5	56





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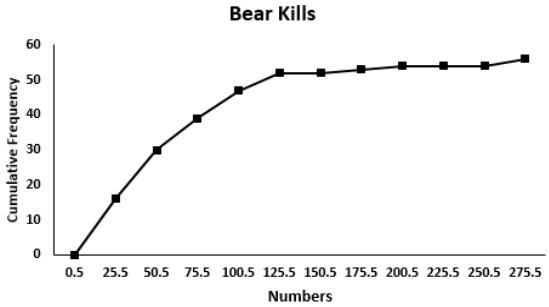

Thirty-nine counties had 75 or fewer bears killed.

3.

Limits	*Boundaries*	X_m	*f*
9 - 11	8.5 - 11.5	10	2
12 - 14	11.5 - 14.5	13	20
15 - 17	14.5 - 17.5	16	18
18 - 20	17.5 - 20.5	19	7
21 - 23	20.5 - 23.5	22	2
24 - 26	23.5 - 26.5	25	1
			50

	cf
Less than 8.5	0
Less than 11.5	2
Less than 14.5	22
Less than 17.5	40
Less than 20.5	47
Less than 23.5	49
Less than 26.5	50

The distribution is positively skewed with a peak at the class of 11.5–14.5.

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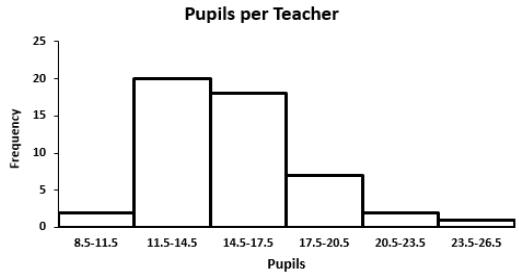
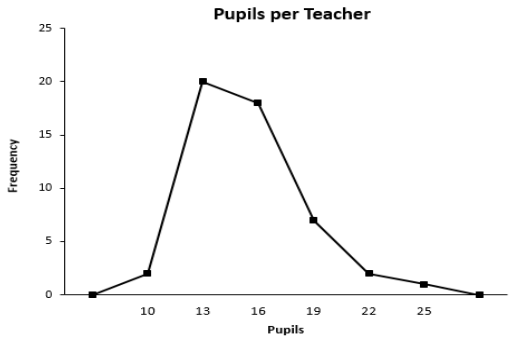
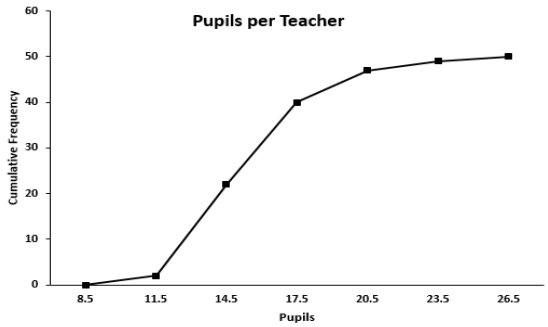
3. continued





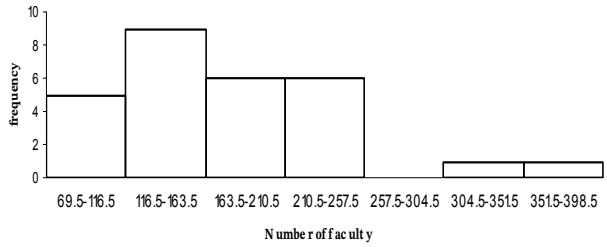


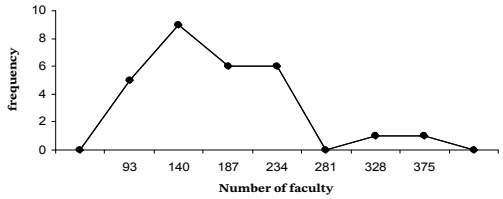
4.

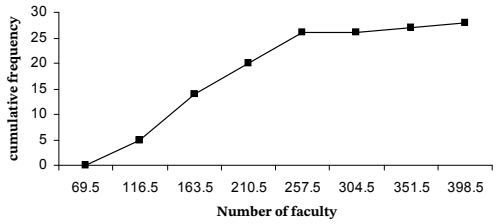
Limits	*Boundaries*	X_m	f
70 - 116	69.5 - 116.5	93	5
117 - 163	116.5 - 163.5	140	9
164 - 210	163.5 - 210.5	187	6
211 - 257	210.5 - 257.5	234	6
258 - 304	257.5 - 304.5	281	0
305 - 351	304.5 - 351.5	328	1
352 - 398	351.5 - 398.5	375	1
			28

4. continued

	cf
Less than 69.5	0
Less than 116.5	5
Less than 163.5	14
Less than 210.5	20
Less than 257.5	26
Less than 304.5	26
Less than 351.5	27
Less than 398.5	28







$\frac{12}{28} = 0.429$ or 42.9% have 180 or more.
The histogram and frequency polygon are positively skewed.

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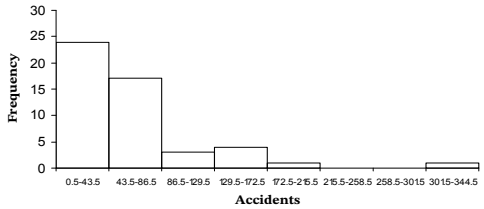
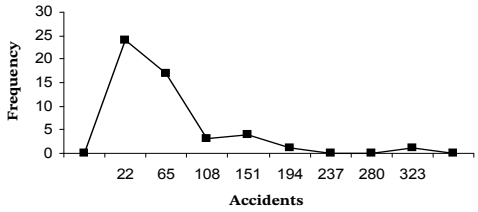
5.

Limits	*Boundaries*	X_m	*f*
1 - 43	0.5 - 43.5	22	24
44 - 86	43.5 - 86.5	65	17
87 - 129	86.5 - 129.5	108	3
130 - 172	129.5 - 172.5	151	4
173 - 215	172.5 - 215.5	194	1
216 - 258	215.5 - 258.5	237	0
259 - 301	258.5 - 301.5	280	0
302 - 344	301.5 - 344.5	323	1
			50

	cf
Less than 0.5	0
Less than 43.5	24
Less than 86.5	41
Less than 129.5	44
Less than 172.5	48
Less than 215.5	49
Less than 258.5	49
Less than 301.5	49
Less than 344.5	50

The distribution is positively skewed.





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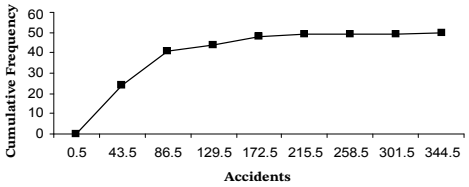
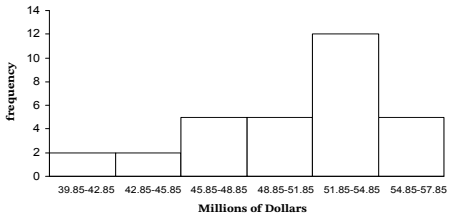
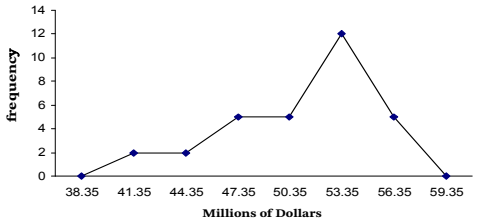


6.

Limits	*Boundaries*	X_m	*f*
39.9 - 42.8	39.85 - 42.85	41.35	2
42.9 - 45.8	42.85 - 45.85	44.35	2
45.9 - 48.8	45.85 - 48.85	47.35	5
48.9 - 51.8	48.85 - 51.85	50.35	5
51.9 - 54.8	51.85 - 54.85	53.35	12
54.9 - 57.8	54.85- 57.85	56.35	5
			31

	cf
Less than 39.85	0
Less than 42.85	2
Less than 45.85	4
Less than 48.85	9
Less than 51.85	14
Less than 54.85	26
Less than 57.85	31





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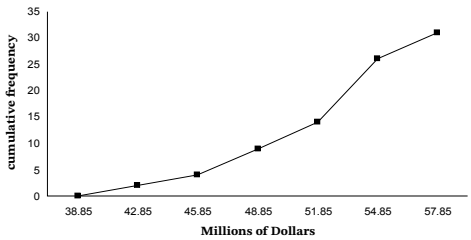
6. continued



The distribution is left skewed or negatively skewed.

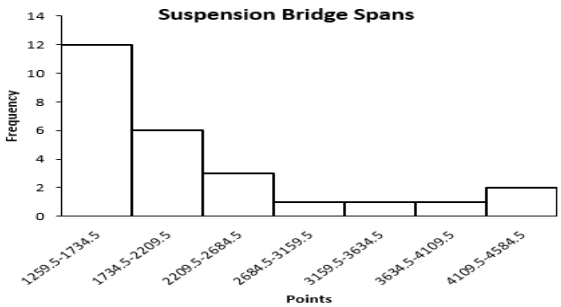
7.

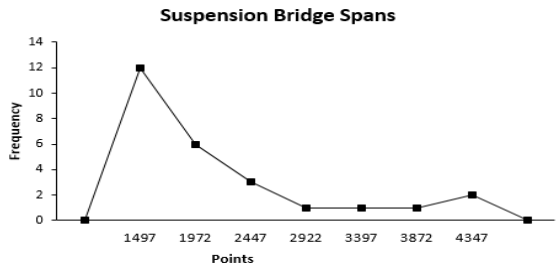
Limits	*Boundaries*	X_m	*f*
1260 - 1734	1259.5 - 1734.5	1497	12
1735 - 2209	1734.5 - 2209.5	1972	6
2210 - 2684	2209.5 - 2684.5	2447	3
2685 - 3159	2684.5 - 3159.5	2922	1
3160 - 3634	3159.5 - 3634.5	3397	1
3635 - 4109	3634.5 - 4109.5	3872	1
4110 - 4584	4109.5 - 4584.5	4347	2

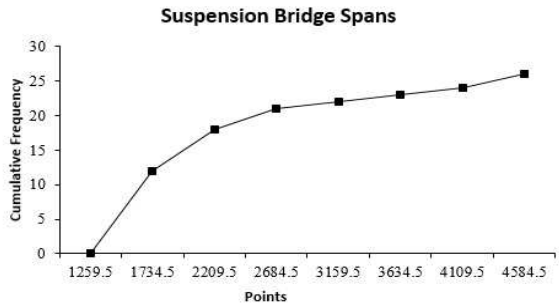
	cf
Less than 1259.5	0
Less than 1734.5	12
Less than 2209.5	18
Less than 2684.5	21
Less than 3159.5	22
Less than 3634.5	23
Less than 4109.5	24
Less than 4584.5	26

The distribution is positively skewed. The class with the most frequencies is 1259.5 1734.5.

7. continued







8.

Limits	*Boundaries*	X_m	*f*
6 - 8	5.5 - 8.5	7	12
9 - 11	8.5 - 11.5	10	16
12 - 14	11.5 - 14.5	13	3
15 - 17	14.5 - 17.5	16	1
18 - 20	17.5 - 20.5	19	0
21 - 23	20.5 - 23.5	22	0
24 - 26	23.5 - 26.5	25	1
			33

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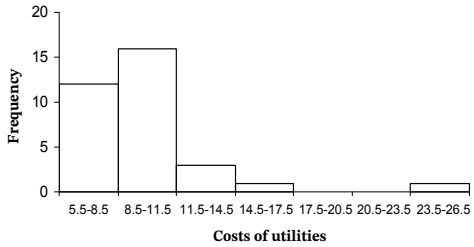
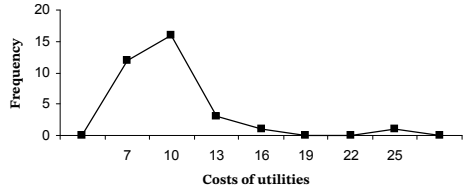
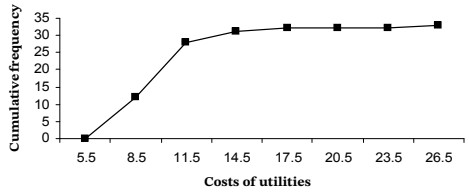
8. continued

	cf
Less than 5.5	0
Less than 8.5	12
Less than 11.5	28
Less than 14.5	31
Less than 17.5	32
Less than 20.5	32
Less than 23.5	32
Less than 26.5	33



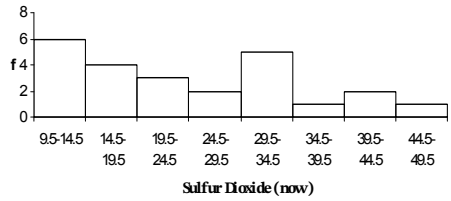


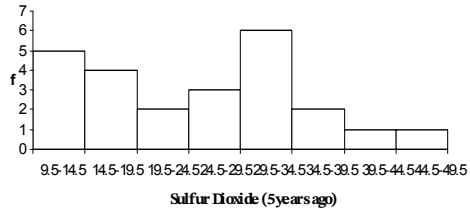


The distribution is positively skewed.

9.

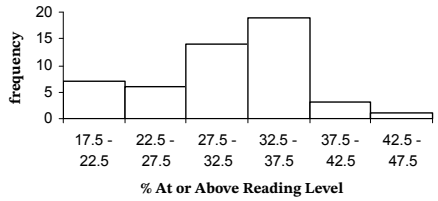
Limits	*Boundaries*	*f(now)*	*f(5 years ago)*
10 - 14	9.5 - 14.5	6	5
15 - 19	14.5 - 19.5	4	4
20 - 24	19.5 - 24.5	3	2
25 - 29	24.5 - 29.5	2	3
30 - 34	29.5 - 34.5	5	6
35 - 39	34.5 - 39.5	1	2
40 - 44	39.5 - 44.5	2	1
45 - 49	44.5 - 49.5	1	1
Total		24	24

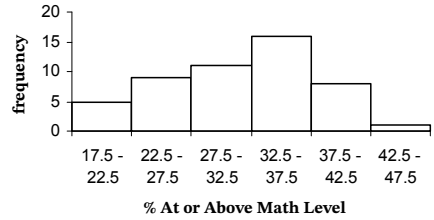




With minor differences, the histograms are fairly similar.

10.





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10. continued

The distribution of math percentages is more bell-shaped than the distribution of reading percentages, and its peak in the class of 32.5 – 37.5 is not as high as the peak of the reading percentages.

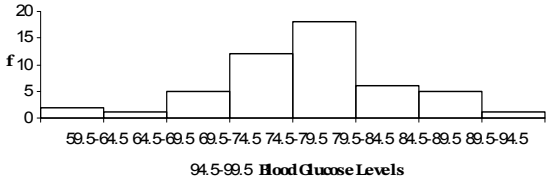
11.

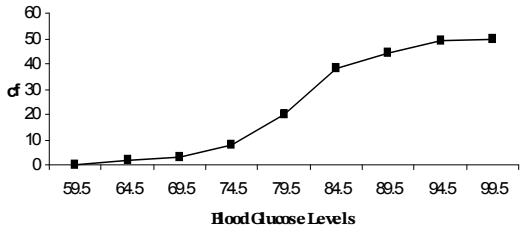
Limits	*Boundaries*	X_m	*f*
60 - 64	59.5 - 64.5	62	2
65 - 69	64.5 - 69.5	67	1
70 - 74	69.5 - 74.5	72	5
75 - 79	74.5 - 79.5	77	12
80 - 84	79.5 - 84.5	82	18
85 - 89	84.5 - 89.5	87	6
90 - 94	89.5 - 94.5	92	5
95 - 99	94.5 - 99.5	97	1
			50

	cf
Less than 59.5	0
Less than 64.5	2
Less than 69.5	3
Less than 74.5	8
Less than 79.5	20
Less than 84.5	38
Less than 89.5	44
Less than 94.5	49
Less than 99.5	50

Most patients fell into the 75–84 range.

11. continued





12.

Limits	*Boundaries*	X_m	*f*
11 - 15	10.5 - 15.5	13	7
16 - 20	15.5 - 20.5	18	9
21 - 25	20.5 - 25.5	23	15
26 - 30	25.5 - 30.5	28	9
31 - 35	30.5 - 35.5	33	5
36 - 40	35.5 - 40.5	38	3
41 - 45	40.5 - 45.5	43	2
			50

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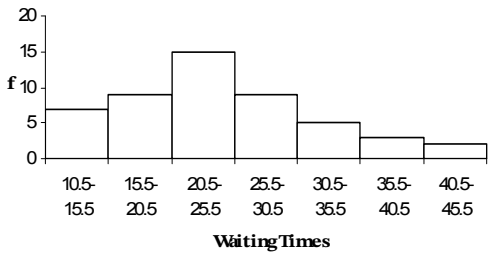
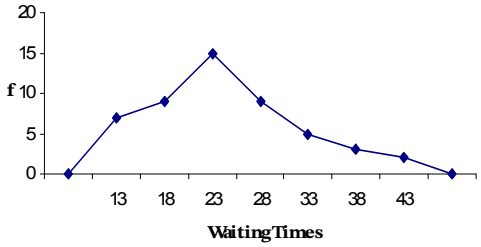
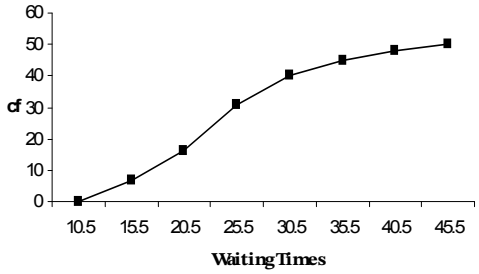
12. continued

	cf
Less than 10.5	0
Less than 15.5	7
Less than 20.5	16
Less than 25.5	31
Less than 30.5	40
Less than 35.5	45
Less than 40.5	48
Less than 45.5	50





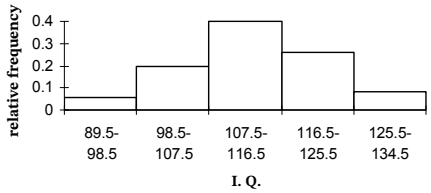


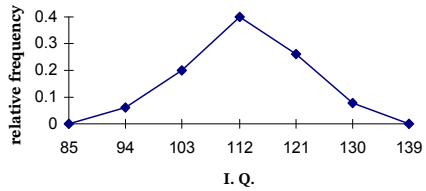
Ten patients waited longer than 30 minutes.

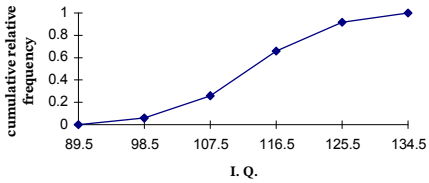
13.

Boundaries	X_m	*rf*
89.5 - 98.5	94	0.06
98.5 - 107.5	103	0.20
107.5 - 116.5	112	0.40
116.5 - 125.5	121	0.26
125.5 - 134.5	130	0.08
		1.00

	crf
Less than 89.5	0
Less than 98.5	0.06
Less than 107.5	0.26
Less than 116.5	0.66
Less than 125.5	0.92
Less than 134.5	1.00







The proportion of applicants who do not need to enroll in the development program is about 0.74.

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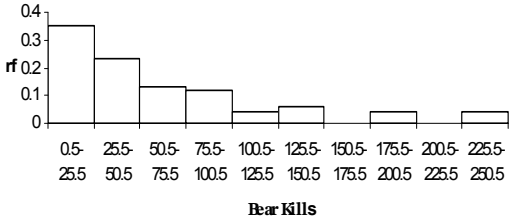
14.

Boundaries	X_m	*rf*
0.5 - 25.5	13	0.29
25.5 - 50.5	38	0.25
50.5 - 75.5	63	0.16
75.5 - 100.5	88	0.14
100.5 - 125.5	113	0.09
125.5 - 150.5	138	0.00
150.5 - 175.5	163	0.02
175.5 - 200.5	188	0.02
200.5 - 225.5	213	0.00
225.5 - 250.5	238	0.00
250.5 - 275.5	263	0.04
		1.01

	crf
Less than 0.5	0
Less than 25.5	0.29
Less than 50.5	0.54
Less than 75.5	0.70
Less than 100.5	0.84
Less than 125.5	0.93
Less than 150.5	0.93
Less than 175.5	0.95
Less than 200.5	0.97
Less than 225.5	0.97
Less than 250.5	0.97
Less than 275.5	1.01

(differences in totals are due to rounding)

14. continued



15.

Boundaries	X_m	*rf*
0.5 - 43.5	22	0.48
43.5 - 86.5	65	0.34
86.5 - 129.5	108	0.06
129.5 - 172.5	151	0.08
172.5 - 215.5	194	0.02
215.5 - 258.5	237	0.00
258.5 - 301.5	280	0.00
301.5 - 344.5	323	0.02
		1.00

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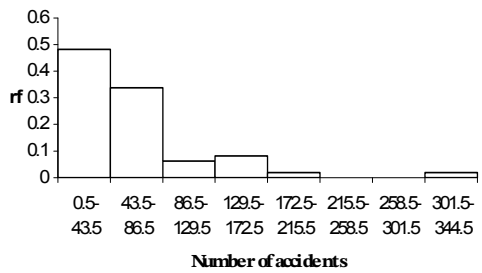
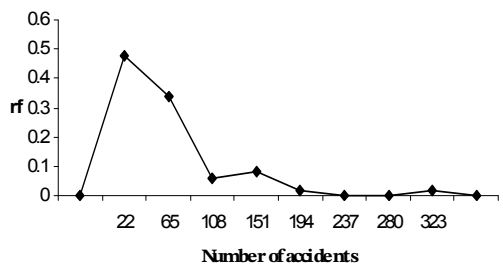
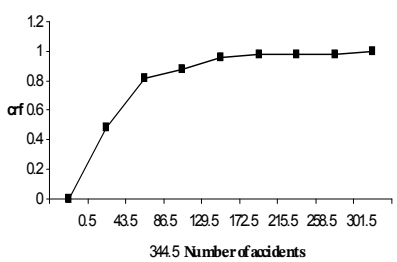
15. continued

	crf
Less than 0.5	0
Less than 43.5	0.48
Less than 86.5	0.82
Less than 129.5	0.88
Less than 172.5	0.96
Less than 215.5	0.98
Less than 258.5	0.98
Less than 301.5	0.98
Less than 344.5	1.00







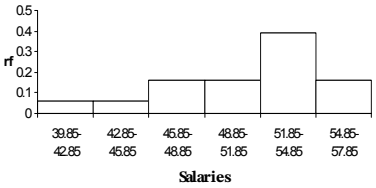
16.

Boundaries	X_m	*rf*
39.85 - 42.85	41.35	0.06
42.85 - 45.85	44.35	0.06
45.85 - 48.85	47.35	0.16
48.85 - 51.85	50.35	0.16
51.85 - 54.85	53.35	0.39
54.85 - 57.85	56.35	0.16
		0.99

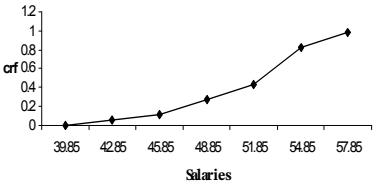
(difference is due to rounding)

	crf
Less than 39.85	0
Less than 42.85	0.06
Less than 45.85	0.12
Less than 48.85	0.28
Less than 51.85	0.44
Less than 54.85	0.83
Less than 57.85	0.99

(difference is due to rounding)



The distribution is negatively or left-skewed.



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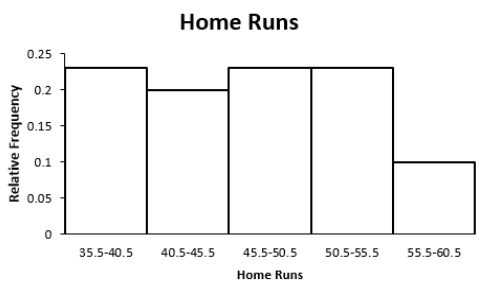
17.

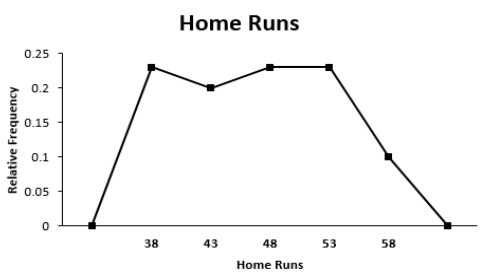
Boundaries	X_m	*rf*
35.5 - 40.5	38	0.23
40.5 - 45.5	43	0.20
45.5 - 50.5	48	0.23
50.5 - 55.5	53	0.23
55.5 - 60.5	58	0.10
		0.99*

*due to rounding

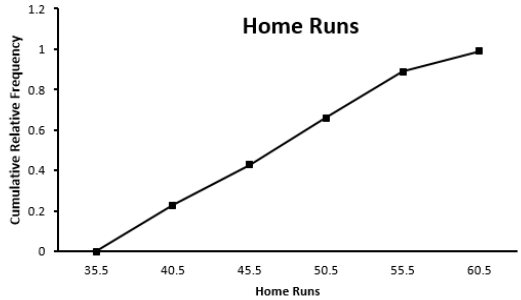
	crf
Less than 35.5	0.00
Less than 40.5	0.23
Less than 45.5	0.43
Less than 50.5	0.66
Less than 55.5	0.89
Less than 60.5	0.99



The graph is fairly uniform, except for the last class in which the relative frequency drops significantly.



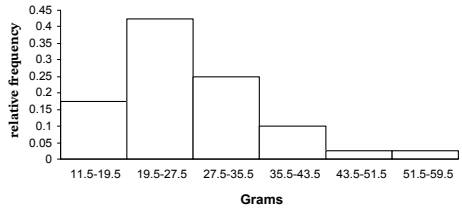
17. continued



18.

Boundaries	X_m	*rf*
11.5 - 19.5	15.5	0.175
19.5 - 27.5	23.5	0.425
27.5 - 35.5	31.5	0.250
35.5 - 43.5	39.5	0.100
43.5 - 51.5	47.5	0.025
51.5 - 59.5	55.5	0.025
		1.000

	crf
Less than 11.5	0.000
Less than 19.5	0.175
Less than 27.5	0.600
Less than 35.5	0.850
Less than 43.5	0.950
Less than 51.5	0.975
Less than 59.5	1.000



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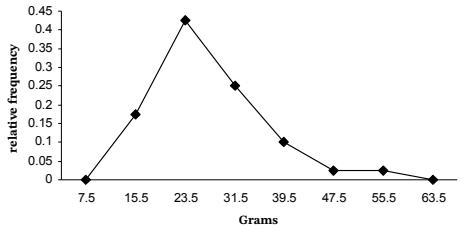
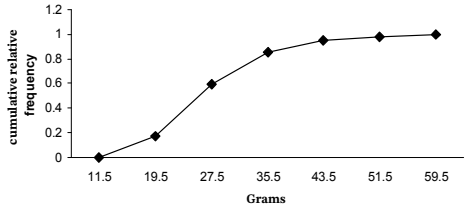
18. continued





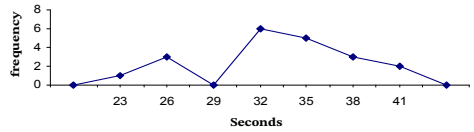
The histogram is positively skewed.

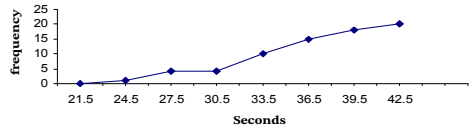
19.

Limits	*Boundaries*	X_m	*f*
22 - 24	21.5 - 24.5	23	1
25 - 27	24.5 - 27.5	26	3
28 - 30	27.5 - 30.5	29	0
31 - 33	30.5 - 33.5	32	6
34 - 36	33.5 - 36.5	35	5
37 - 39	36.5 - 39.5	38	3
40 - 42	39.5 - 42.5	41	2
			20

	cf
Less than 21.5	0
Less than 24.5	1
Less than 27.5	4
Less than 30.5	4
Less than 33.5	10
Less than 36.5	15
Less than 39.5	18
Less than 42.5	20

19. continued





20.

a. 0

b. 14

c. 10

d. 16

21.

Boundaries	X_m	*f*
468.5 - 495.5	482	6
495.5 - 522.5	509	15
522.5 - 549.5	536	10
549.5 - 576.5	563	7
576.5 - 603.5	590	6
603.5 - 630.5	617	6
		50

	f
Less than 468.5	0
Less than 495.5	6
Less than 522.5	21
Less than 549.5	31
Less than 576.5	38
Less than 603.5	44
Less than 630.5	50

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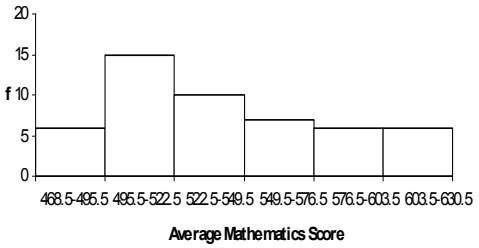
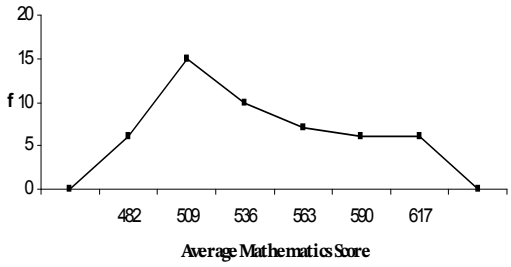
21. continued

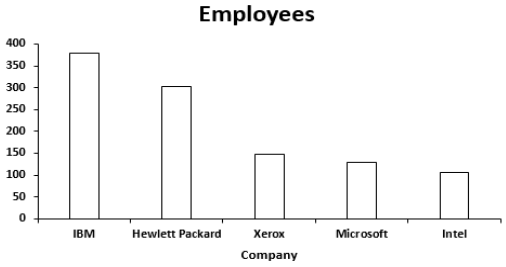




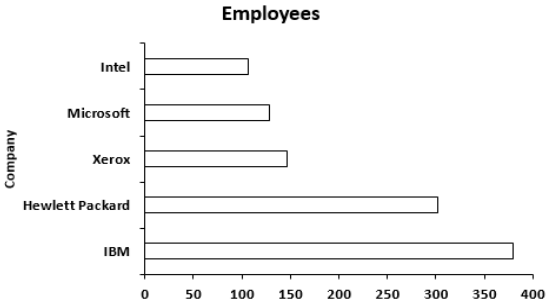
EXERCISE SET 2-3

1.

	f
IBM	380
Hewlett Packard	302
Xerox	147
Microsoft	128
Intel	107

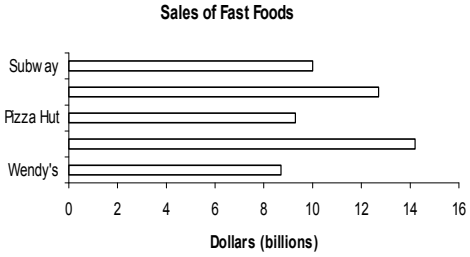


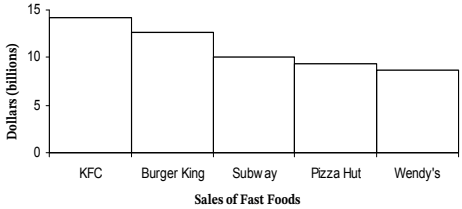
1. continued



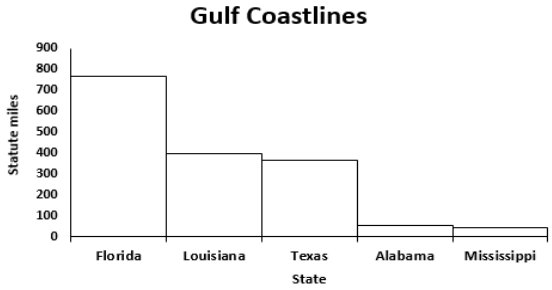
2.

	f
Wendy's	$8.7
KFC	14.2
Pizza Hut	9.3
Burger King	12.7
Subway	10.0





3.



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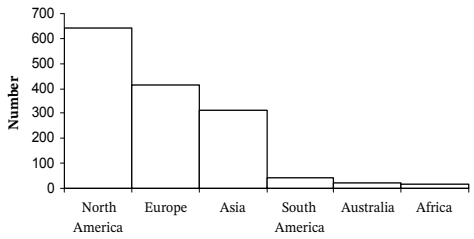
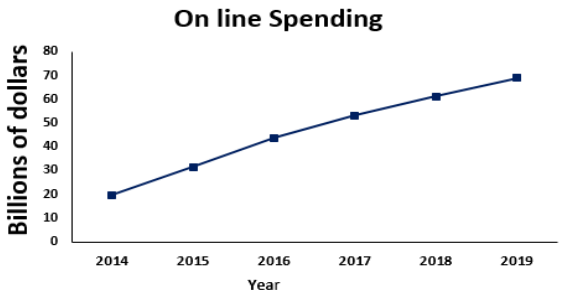
4.

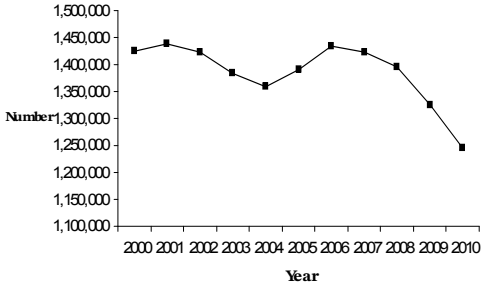


5.



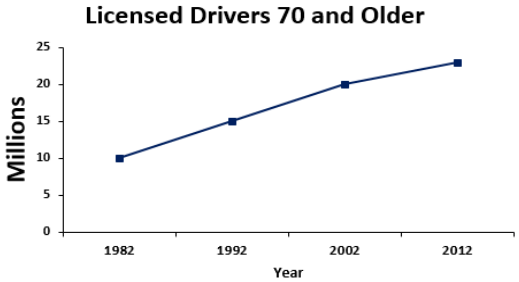
There is a steady increase over the years.

6.

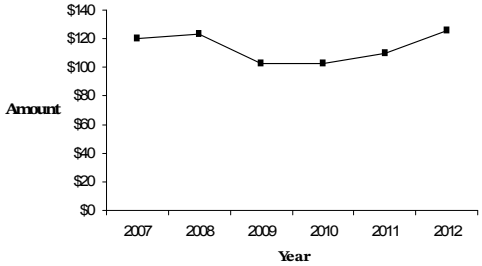


Crime decreased between 2001 and 2004, increased between 2004 and 2006, then decreased steadily from 2007 to 2010.

7.

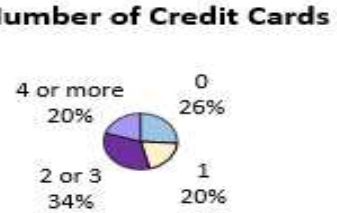


8.



There was an increase in spending between 2007 and 2008 followed by a decrease in spending between 2008 and 2009. Spending showed slight increases in 2010, 2011, and 2012.

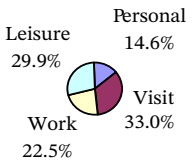
9.



More people have 2 or 3 credit cards.

10.

Personal Business	146	14.6%	52.56°
Visit friends or	330	33.0%	118.8°
family Work-related	225	22.5%	81.0°
Leisure	299	29.9%	107.64°
	1000	100%	360°



About $\frac{1}{3}$ of the travelers visit friends or relatives, with the fewest travelling for personal business.

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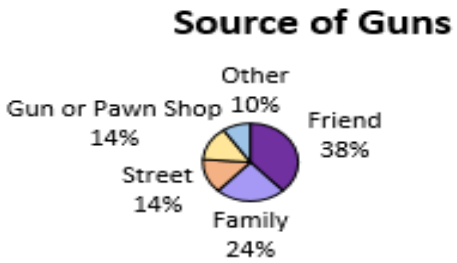
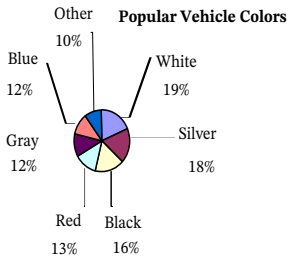
11.



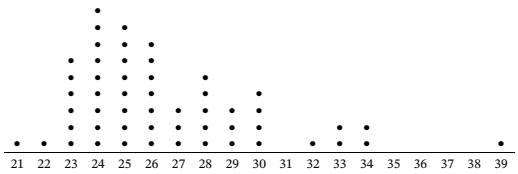
Guns from friends accounted for 38% of the total usage.

12.

White	19%	68.4°
Silver	18%	64.8°
Black	16%	57.6°
Red	13%	46.8°
Gray	12%	43.2°
Blue	12%	43.2°
Other	10%	36.0°



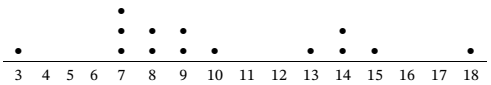
13.



The dotplot is somewhat positively skewed and shows that the majority of the players are between 21 and 30 years old. There are 2 peaks at 24 years old with 9 players, and at 25 years old with 8

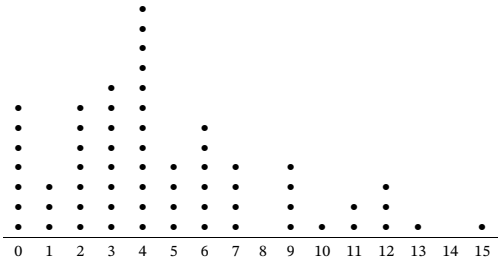
13. continued
players. The dot plot is positively skewed with a gap between 34 and 39.

14.



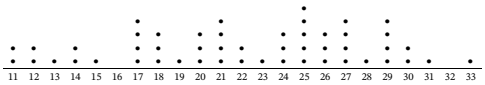
The number of teacher strikes ranges from 3 strikes to 18 strikes. The data clusters between 7 and 10 strikes and between 13 and 15 strikes. There are three gaps in the distribution and one peak at 7.

15.



The distribution is positively skewed. The data peaks at experience year 4 and gaps between the experience years of 7 to 9 and 13 to 15. The data clusters between years 0 to 7 and 9 to 13 with a peak at 25 minutes.

16.



The commuting times range from 11 minutes to 33 minutes. The data clusters between 17 and 31 minutes and gaps at 16 and 32 minutes.

17.

5	0 0 0 0 0 0 1 1 1 1 1 2 2 2 2 2 2 3 4 4 4 4 4 4 4
5	6 6 6 7 7 8 8 8 8 9
6	0 1 3 4
6	5 6
7	0 3

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17. continued

Most players in the club have hit 50 to 54 home runs in one season. The maximum number of home runs hit is 73.

18.

Calories in Salad Dressings

10	0 0 0 0 0
11	0 0 5
12	0 0 0 0 0 0
13	0 0 0 0 0
14	0 0 0 0 5 5 5
15	0 0 0
16	0 0 0 0 0
17	0
18	0 0
19	0

19.

Lengths of Major Rivers

South America		Europe
	2	0 3 4 4
		0 5 5 5 5 6 6 6 6 7 8 8 9
4 2 1 0 0 0 0 0 0 0	1	.1 2 3 4
7 6 5 5	1	8
	1	2
	5	2
		3
	9	3

The majority of the South American rivers are longer than those in Europe.

20.

Math and Reading Achievement Scores

Math		Reading
9 9 9 7 5 5 2	5	
9 8 6 3 2 1	6	1 1 5 6 6 7 9
6 4 3 3 2	7	0 0 1 6 6 6 7 7 7 8
	8	0

The reading scores are somewhat higher than the math scores.

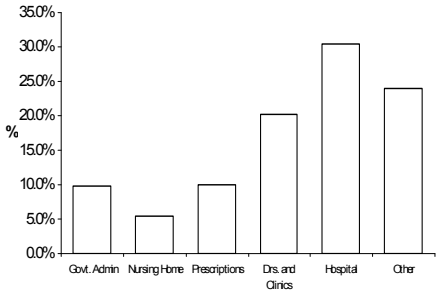
21.

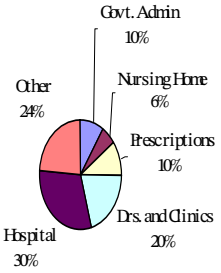
a. Pareto chart
b. Pareto chart
c. Pie graph
d. Time series graph
e. Pareto chart
f. Time series graph

22.

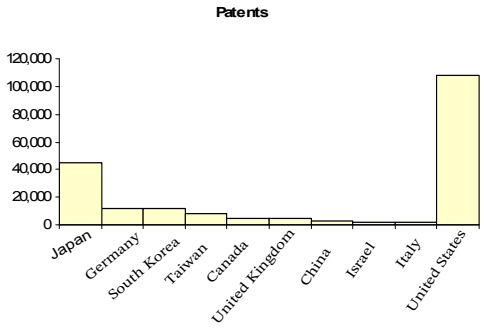
a. Time series graph
b. Pie graph
c. Pareto chart
d. Pie graph
e. Time series graph
f. Pareto chart

23.





24.



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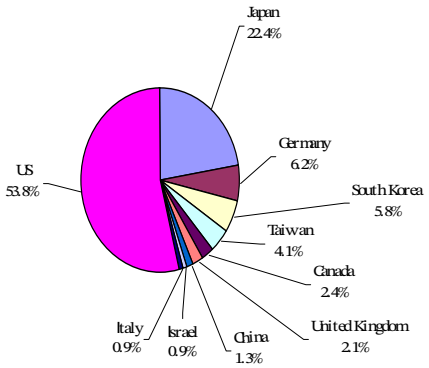
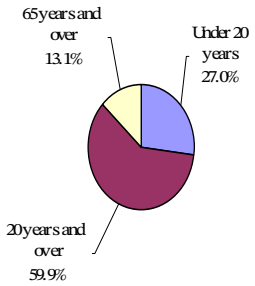
24. continued



The bar graph is better since there are too many categories for the pie graph.

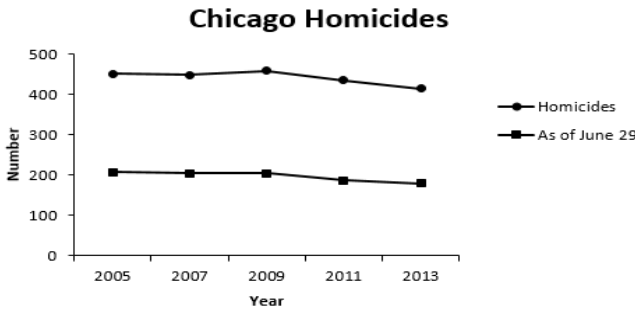
25. The bottle for 2011 is much bigger in area than the bottle for 1988. This causes the eye to see a much bigger difference than the actual difference.

26.



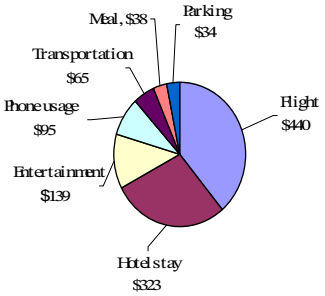
No. You need to subtract 13.1% from 73.0% to get 59.9%.

27.



There's no way to tell if the crime rate is decreasing by looking at the graph.

28.



Note: Other graphs could be drawn to illustrate this data

EXERCISE SET 2-4

1. Scatter plot or scatter diagram.

2. The two variables used are the independent variable, x, and the dependent variable, y.

3. Two variables are positively related when the dependent variable, y, increases as the independent variable, x, increases. The points on the scatter plot fall approximately in an ascending straight line.

4. Two variables are negatively related when the dependent variable, y, decreases as the independent variable, x, increases.

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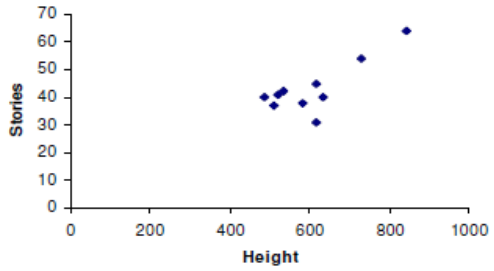
4. continued

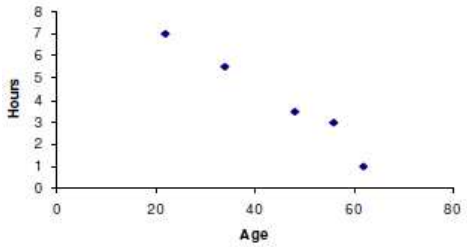
The points on the scatter plot fall approximately in a descending straight line.

5.



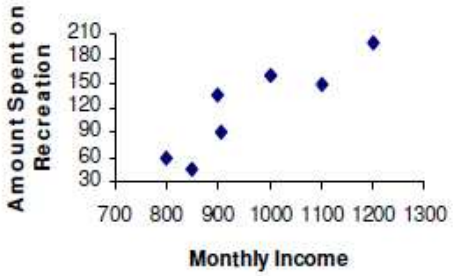
There appears to be a positive linear relationship between the height of a building and the number of stories in the building.

6.



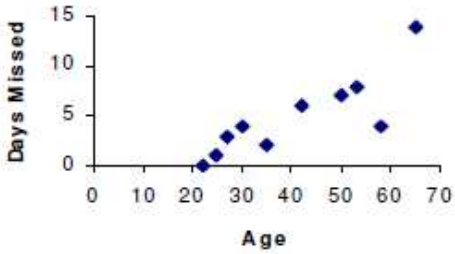
There appears to be a negative linear relationship between age and the number of hours spent jogging per week.

7.



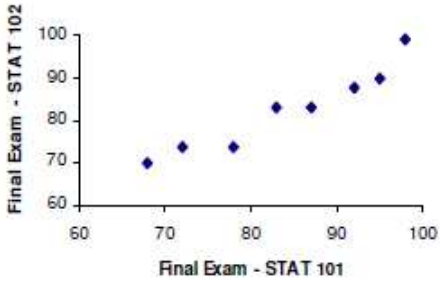
There appears to be a positive linear relationship between monthly income and amount spent on recreation.

8.



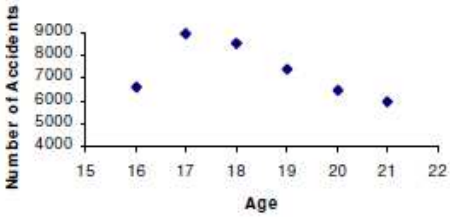
There appears to be a positive linear relationship between an employee's age and the number of days missed per year.

9.



There appears to be a positive linear realationship between a student's final exam score in STAT 101 and STAT 102.

10.



There appears to be a negative linear relationship between the age of a driver and the number of accidents per year.

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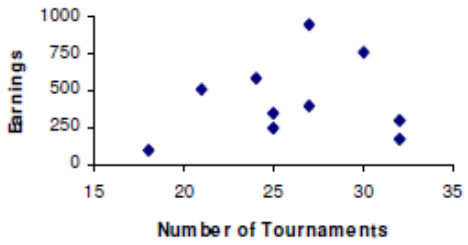
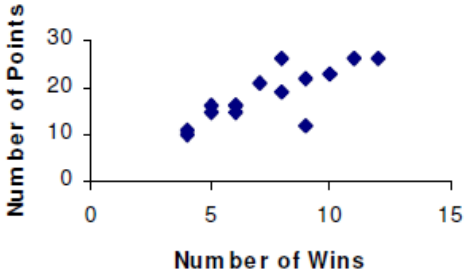
11.



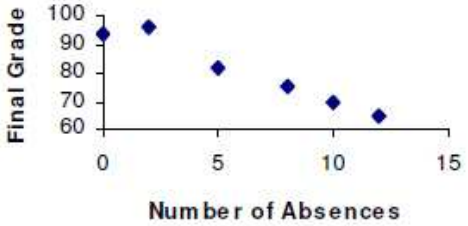
There appears to be neither a positive nor a negative linear relationship between the number of tournaments and the earnings of LPGA golfers.

12.



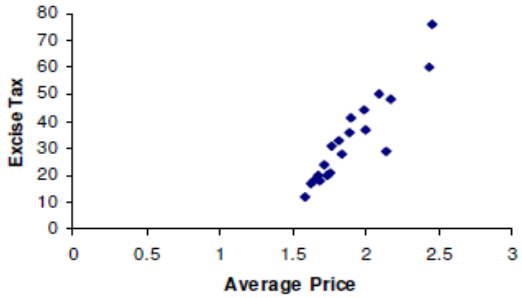
There appears to be a positive linear relationship between the number of wins and the points scored by NHL teams.

13.



There appears to be a negative linear relationship between the number of absences and a student's final grade in a course.

14.



There appears to be a positive linear relationship between the average price per pack of cigarettes and state excise tax.

REVIEW EXERCISES - CHAPTER 2

1.

Class	f	Percent
Newspaper	10	20
Television	16	32
Radio	12	24
Internet	12	24
	50	100

2.

Class	f	Percent
Sweden	7	21.9
Canada	6	18.8
Czech Republic	7	21.9
Russia	5	15.6
USSR	4	12.5
Finland	2	6.3
Slovakia	1	3.1
Total	32	100.1

Russia was part of the USSR, and the Czech Republic and Slovakia were part of Czechoslovakia, so it is hard to determine which country should be credited with the medals.

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3.

Class	f
11	1
12	2
13	2
14	2
15	1
16	2
17	4
18	2
19	2
20	1
21	0
22	1
	20

	cf
less than 10.5	0
less than 11.5	1
less than 12.5	3
less than 13.5	5
less than 14.5	7
less than 15.5	8
less than 16.5	10
less than 17.5	14
less than 18.5	16
less than 19.5	18
less than 20.5	19
less than 21.5	19
less than 22.5	20

4.

Limits	Boundaries	f
8	7.5 - 8.5	11
9	8.5 - 9.5	10
10	9.5 - 10.5	4
11	10.5 - 11.5	2
12	11.5 - 12.5	2
13	12.5 - 13.5	4
14	13.5 - 14.5	2
15	14.5 - 15.5	1
		36

	cf
7.5 - 8.5	11
8.5 - 9.5	21
9.5 - 10.5	25
10.5 - 11.5	27
11.5 - 12.5	29
12.5 - 13.5	33
13.5 - 14.5	35
14.5 - 15.5	36

5.

Limits	*Boundaries*	*f*
53 - 185	52.5 - 185.5	8
186 - 318	185.5 - 318.5	11
319 - 451	318.5 - 451.5	2
452 - 584	451.5 - 584.5	1
585 - 717	584.5 - 717.5	4
718 - 850	717.5 - 850.5	2
		28

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5. continued

	cf
Less than 52.5	0
Less than 185.5	8
Less than 318.5	19
Less than 451.5	21
Less than 584.5	22
Less than 717.5	26
Less than 850.5	28

6.

Limits	*Boundaries*	*f*
51 - 59	50.5 - 59.5	5
60 - 68	59.5 - 68.5	12
69 - 77	68.5 - 77.5	11
78 - 86	77.5 - 86.5	8
87 - 95	86.5 - 95.5	3
96 - 104	95.5 - 104.5	2
		41

	cf
Less than 50.5	0
Less than 59.5	5
Less than 68.5	17
Less than 77.5	28
Less than 86.5	36
Less than 95.5	39
Less than 104.5	41

Note: Graphs are not to scale and are intended to convey a general idea. Answers may vary due to rounding.

7.

Limits	*Boundaries*	*rf*
53 - 185	52.5 - 185.5	0.29
186 - 318	185.5 - 318.5	0.39
319 - 451	318.5 - 451.5	0.07
452 - 584	451.5 - 584.5	0.04
585 - 717	584.5 - 717.5	0.14
718 - 850	717.5 - 850.5	0.07
		1.00

	crf
Less than 52.5	0
Less than 185.5	0.29
Less than 318.5	0.68
Less than 451.5	0.75
Less than 584.5	0.79
Less than 717.5	0.93
Less than 850.5	1.00

8.

Limits	*Boundaries*	*rf*
51 - 59	50.5 - 59.5	0.122
60 - 68	59.5 - 68.5	0.293
69 - 77	68.5 - 77.5	0.268
78 - 86	77.5 - 86.5	0.195
87 - 95	86.5 - 95.5	0.073
96 - 104	95.5 - 104.5	0.049
		1.000

	crf
Less than 50.5	0.000
Less than 59.5	0.122
Less than 68.5	0.415
Less than 77.5	0.683
Less than 86.5	0.878
Less than 95.5	0.951
Less than 104.5	1.000

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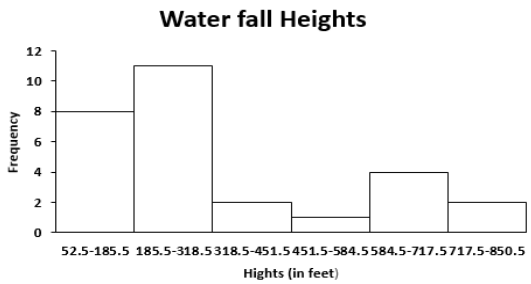
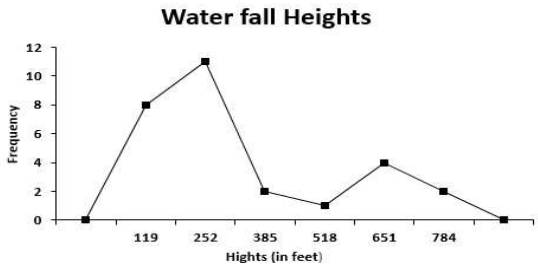
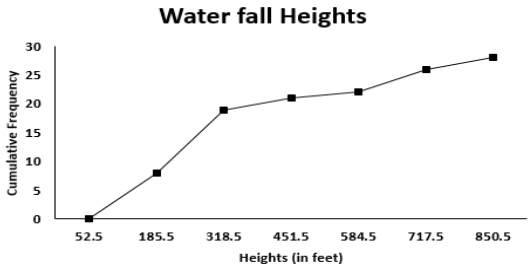
9.







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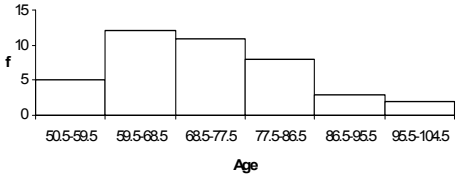

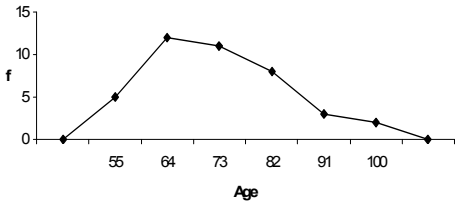

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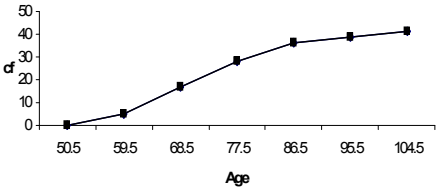

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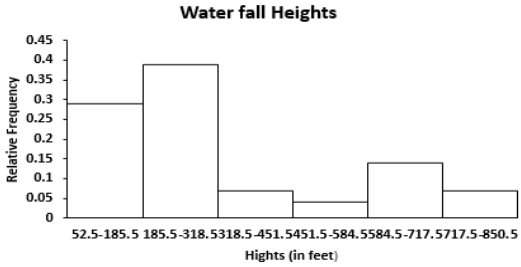

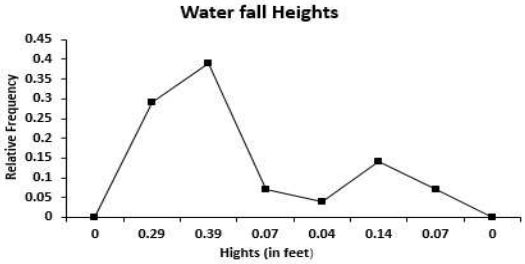

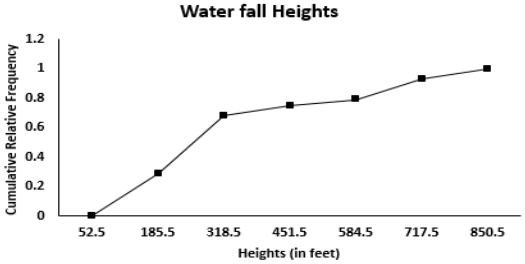

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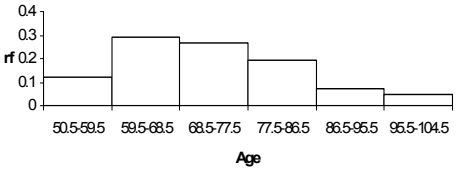

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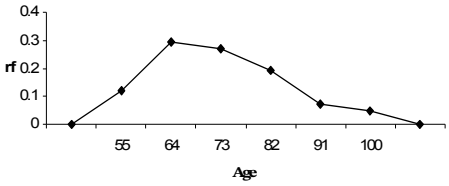
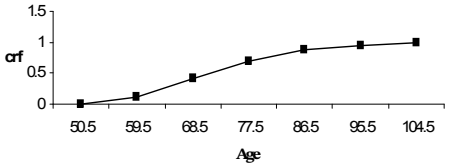
12. continued





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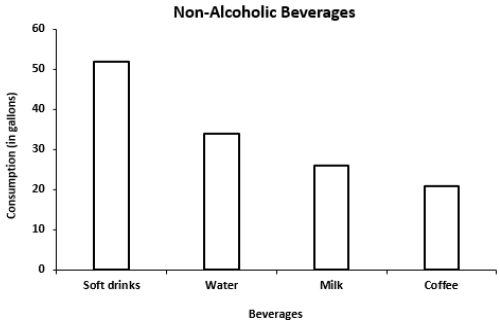

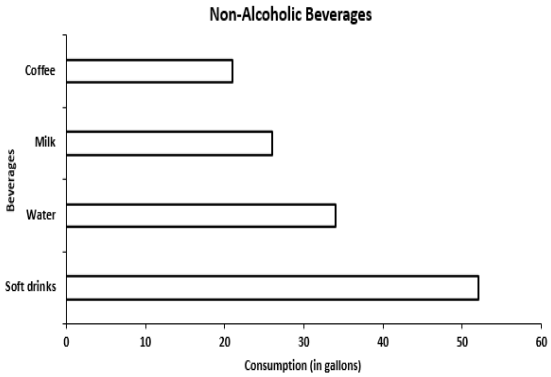

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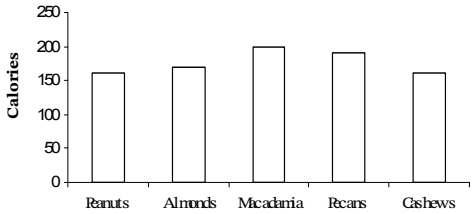

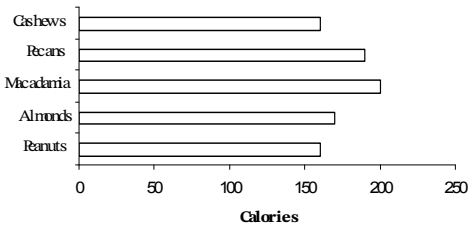

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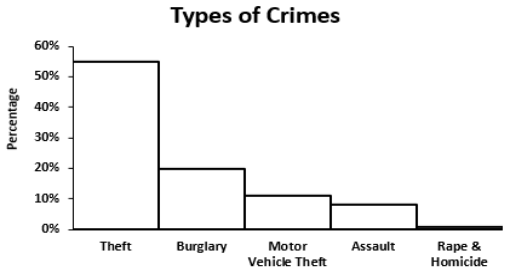

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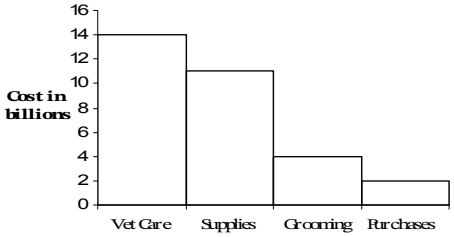

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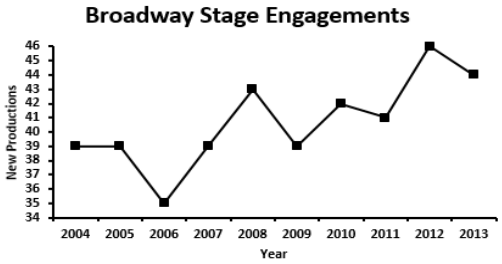
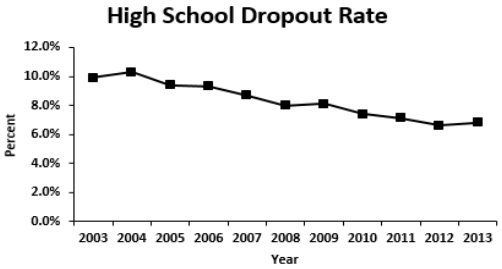
17.



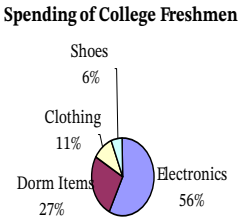
New Productions declined from 2005 to 2006; then, it increased each year until 2008. There was a slight increase in 2010 and 2012.

18.



The dropout rate increased slightly from 2003 to 2004; then, it decreased slightly each year until 2008. There was a slight increase in 2009 and 2013.

19.



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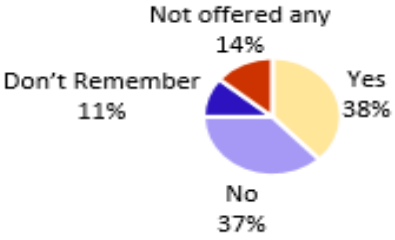

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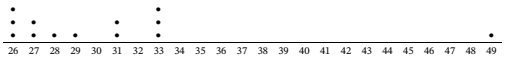
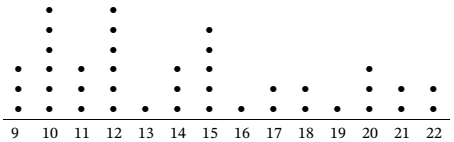


The graph shows almost all but one of the touchdowns per season for Manning's career were between 26 and 33.

22.



The distribution is somewhat positively skewed, and the majority of the CDs (27) had between 9 and 15 songs on them.

23.

20	2 3 6
21	3 5 8 9 9
22	0 1 3 3 4 7
23	0 2 3 3 5 8 9
24	6 8 9
25	4 4 6 8
26	2 3

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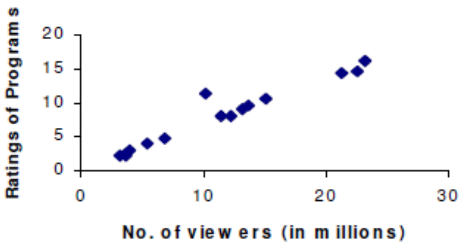
24.

10	2 8 8
11	3
12	
13	
14	2 4
15	
16	
17	6 6 6
18	4 9
19	2
20	5 9
21	0

25.
The graphs are misleading because no scale is used on the x and y axes. So it is impossible to tell the times of the pain relief.

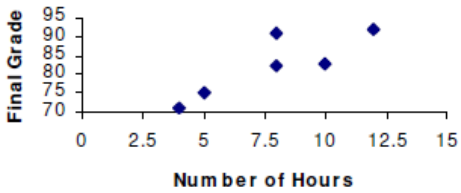
26.
The difference between payoffs appears large, but is only 3%. The scale on the y axis may be truncated.

27.



There appears to be a positive linear relationship between the number of viewers (in millions) and the ratings of 15 television programs.

28.



There appears to be a positive linear relationship between the final grade a student receives and the number of hours of tutoring received by the student.

CHAPTER 2 QUIZ

1. False
2. True
3. False
4. True
5. True
6. False
7. False
8. c
9. c
10. b
11. b
12. Categorical, ungrouped, grouped
13. 5, 20
14. Categorical
15. Time series
16. Stem and leaf plot
17. Vertical or y

18.

Class	f	Percent
H	6	24
A	5	20
M	6	24
C	8	32
	25	

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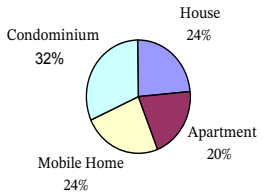
19.

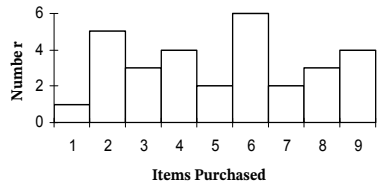


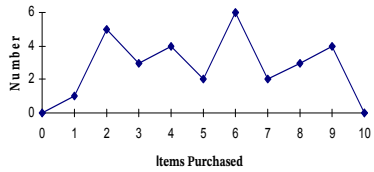
20.

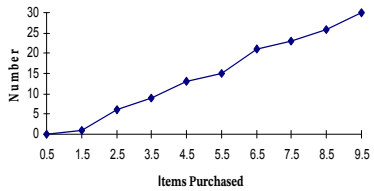
Limits	Boundaries	f
1	0.5 – 1.5	1
2	1.5 – 2.5	5
3	2.5 – 3.5	3
4	3.5 – 4.5	4
5	4.5 – 5.5	2
6	5.5 – 6.5	6
7	6.5 – 7.5	2
8	7.5 – 8.5	3
9	8.5 – 9.5	4
		30

	cf
less than 0.5	0
less than 1.5	1
less than 2.5	6
less than 3.5	9
less than 4.5	13
less than 5.5	15
less than 6.5	21
less than 7.5	23
less than 8.5	26
less than 9.5	30

21.







22.

Limits	X_m	*Boundaries*	*f*	*rf*
0 - 214	107	-0.5 - 214.5	20	0.39
215 - 429	322	214.5 - 429.5	15	0.29
430 - 644	537	429.5 - 644.5	5	0.10
645 - 859	752	644.5 - 859.5	5	0.10
860 - 1074	967	859.5 - 1074.5	2	0.04
1075 - 1289	1182	1074.5 - 1289.5	2	0.04
1290 - 1504	1397	1289.5 - 1504.5	2	0.04
			51	1.00

	cf	*crf*
Less than 0	0	0
Less than 214.5	20	0.39
Less than 429.5	35	0.68
Less than 644.5	40	0.78
Less than 859.5	45	0.88
Less than 1074.5	47	0.92
Less than 1289.5	49	0.96
Less than 1504.5	51	1.00

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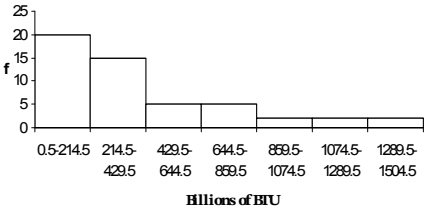
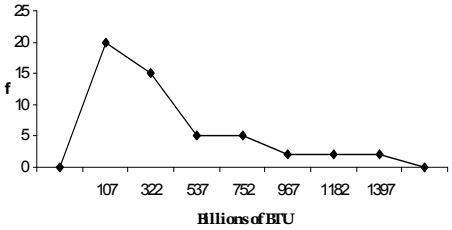
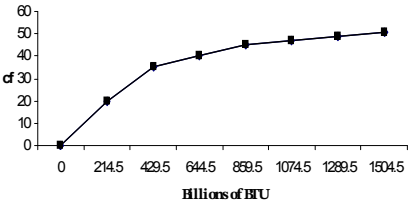
23.







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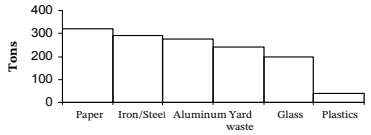

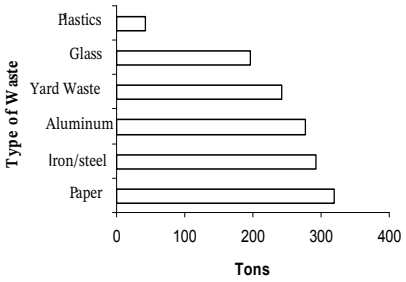

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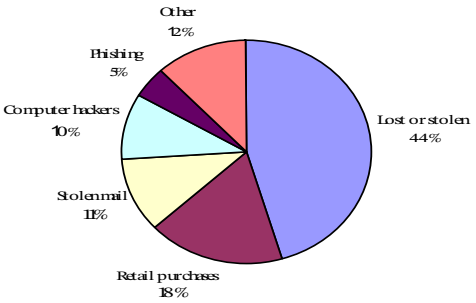

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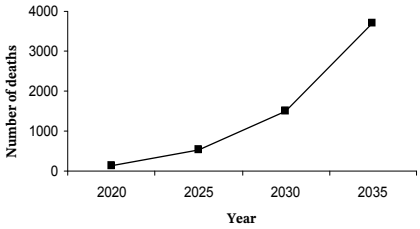
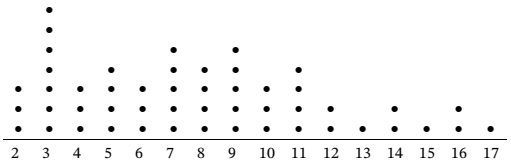


27.

1	5 9
2	6 8
3	1 5 8 8 9
4	1 7 8
5	3 3 4
6	2 3 7 8
7	6 9
8	6 8 9
9	8

28.



29.

The bottles have different areas, so your eyes will compare areas instead of heights.

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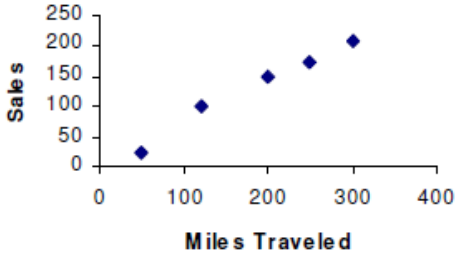
30.



There appears to be a positive linear relationship between the number of miles traveled and the sales (in hundreds of dollars) of a sales representative.

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